SCIENCE & EDUCATION
Impact
Benefits from USDA/Land-Grant Partnership

Sustainability for Today and Tomorrow

Practices must be economically and environmentally compatible.

In a rapidly changing world, agricultural producers must respond to new environmental, economic and social challenges to remain competitive. Their use of natural resources and production practices must be compatible with long-term environmental protection goals. In other words, their practices must be sustainable over many decades. To help agriculture meet those challenges, USDA and Land-Grant universities are developing a wide range of programs and technologies that are environmentally friendly and economically practical. Some programs are funded with regional USDA Sustainable Agricultural Research and Education or SARE grants.

Payoff

- **Regional resources.** With the help of USDA grants, four new regional pest management centers have been established to give farmers and ranchers accurate, up-to-date information on pests and diseases. Sustainable production, environmental protection and food safety are major goals. A **Florida** center is serving 13 southern states, Puerto Rico and the U.S. Virgin Islands. Centers at **Illinois** and **Michigan State** are helping producers in the north central region, while **Cornell** and **Penn State** cover the northeast. **California-Davis** serves the western region.

- **BMPs make a difference.** Waste from poultry and other animal farms is being used successfully, thanks to new Best Management Practices developed in many states. BMPs are essential to the long-term sustainability of livestock farms, particularly when they're located in areas where animal waste threatens surface or groundwater. **Louisiana State** researchers are using poultry litter to fertilize bermudagrass and bahiagrass pastures, loblolly pine plantations and other crops. Compared to commercial products, poultry litter reduces fertilizer costs on pastures by 39 percent, saving producers more than $36 per acre. Similar results have been achieved on slower-growing loblolly pines.

- **On target.** Until now, pesticide application has been hit or miss — less than 1 percent of the chemical actually reached its target. To reduce waste and enhance sustainability, **Ohio State** scientists developed a sprayer with two nozzles — one sprays a fine mist of pesticide, and the other produces a coarse

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spray of water. When the two sprays interact, water carries pesticide deep into plants. The sprayer, which is being commercialized, uses up to 70 percent less pesticide than regular equipment and controls pests more effectively. It also reduces pesticide in the environment and saves the average Ohio farm $2,500 per year. **Oklahoma State** researchers developed a "smart" tractor/sprayer that senses what plants need and applies the right amount of chemical as the tractor moves through the field. It increases pesticide and fertilizer application efficiency by 70 percent.

- **Conversion and conservation.** Because everyone lives downstream, rivers and watersheds must be protected. A three-year project by **Utah State** Extension is protecting the environment — and enhancing long-term sustainability — by converting more than 5,000 acres of farmland from wasteful furrow or ditch irrigation to sprinkler irrigation. The project saves water, increases crop yields and reduces fertilizer and salinity runoff into the Colorado River by 47,000 tons annually.

- **After the ban.** A 2005 federal ban on a widely used soil fumigant, methyl bromide, will help protect the Earth's ozone layer, but growers nationwide will lose a valuable pest management tool. In many states, the fumigant is the single most important tool to produce high-value fruit and vegetables. Effective substitutes for the fumigant are being developed by researchers at **Auburn**, **California-Davis**, **Florida**, **Georgia**, **North Carolina State**, **Clemson** and **Virginia Tech**.

- **Cotton controls.** Until recently, almost half of all insecticides in the United States were used on cotton. New pest management tools developed by **Arizona** researchers reduce the need to spray the crop, while maintaining competitive yields. The tools are safe for people and the environment. New insect growth regulators stop whiteflies, transgenic cotton resists pink bollworms and integrated pest management controls other troublesome pests. Seasonal sprays have been cut from 11 to just one or two — the lowest rate in 21 years of record keeping.

- **Reduced risk.** While nitrogen is a valuable fertilizer, it can move from fields to ground and surface waters, posing environmental and human health risks. A controlled drainage system developed by **North Carolina State** releases water when fields are wet and retains water during drier periods. Land buffers also help protect surface waters. Used on 600,000 acres in the state, the drainage system reduces by about half the nitrogen previously lost to surface waters. Almost half of all new regulations for managing nutrients in the state are based on the research. The system is being used in other states and countries, too.

- **Native farms.** It's important that American Indian students learn about farming that's sustainable and environmentally friendly so they can pursue agricultural careers on their native lands. To help them realize this goal, the **Southwest Indian Polytechnic Institute** in New Mexico established a traditional farm that promotes native crops. The demonstration farm trains and educates American Indian nations in farming, marketing, budgeting and other topics.

- **New biopesticide**. As more pesticides are removed from the market because of environmental and health concerns, scientists are seeking ways to enhance a crop's own ability to fight pests. **Cornell** researchers have discovered a protein called harpin that helps plants grow, increase yields and mobilize their own defenses. The technology is based on a new class of nontoxic, naturally occurring proteins produced by plant bacteria. Applied to crops, harpin increases resistance to pathogens and pests and results in more biomass due to increased photosynthesis, nutrient uptake and root development. The new biopesticide was granted federal registration in 2000 for use on food and fiber crops, trees, turf and ornamentals.

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